

The Mango Leaf-Coating Mite, *Cisaberoptus kenyae* K.

(Eriophyidae, Aberoptinae)

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Cisaberoptus kenyae Keifer 1966 is a tiny leaf-coating mite widespread in the tropics, having been transported on its host, mango, *Mangifera indica* L. It occurs in southern Asia, east Indian islands, where mango is grown in Africa, and in South America. The white leaf coatings it develops on mango leaves are notable in Kenya and the Sudan. Leaf coatings are conspicuous in Bali, but probably less so in Thailand. These notable white coatings develop primarily along the midrib on the upper surface, but as the colony grows the coating follows lateral veins and goes to leaf margins (Fig. 1).

Leaf specimens submitted from Thailand by Dr. L. C. Knorr, of the Plant Protection Service of the United Nations, reveal that the activities of this mite first can begin inconspicuously on the underside of the leaf petiole. Petioles thus attacked then become covered with the typical coating, and show surface roughening under the coating. But as the colonies enlarge the mites move up the petiole and transfer for the most part to upper leaf surface areas where they start the typical development.

When first examined this mite seemed to be a leaf miner and as such was thought to damage the leaf mechanically. Investigations in the Sudan have shown that there is no leaf mining. Leaf sections from coated leaves do not disclose any direct damage to internal tissue (Fig. 4). What eventually does happen is that as coatings become more and more extensive the leaves tend to yellow and drop prematurely.

A recently published paper by Knorr, Phatak, and Keifer (1976), entitled *Web-spinning eriophyid mites*, may have a suggestion as to the relationship of the white coating to the *kenyae* mites. In the case of the web-spinning species, *Aculops knorri* Keifer (1976), the webs consist of fine discrete strands over the colonies on the upper leaf surfaces. *Aculops knorri* infests a sapindaceous tree, *Lepisanthes rubiginosa* (Roxb.) Leenh., in Thailand. Serological tests proved that the proteinaceous nature of the web these mites cover themselves with, and the mite body proteins, are antigenically closely related.



Fig. 1 — Mango leaves showing upper surface leaf coatings caused by *Cisaberoptus kenyae*. Left leaf with early infestation; right leaf with more advanced infestation. Ca. 0.57 X.

While the white coating on mango leaves does not readily disclose separate strands, like the webbing on the *Lepisanthes* leaves, microscopic examination of the coating (Fig. 3) reveals that it consists of what might be called *crude strands* that are irregular. These strands assume various forms and bunches. The view adopted here is that the white leaf coating is some sort of regurgitation.

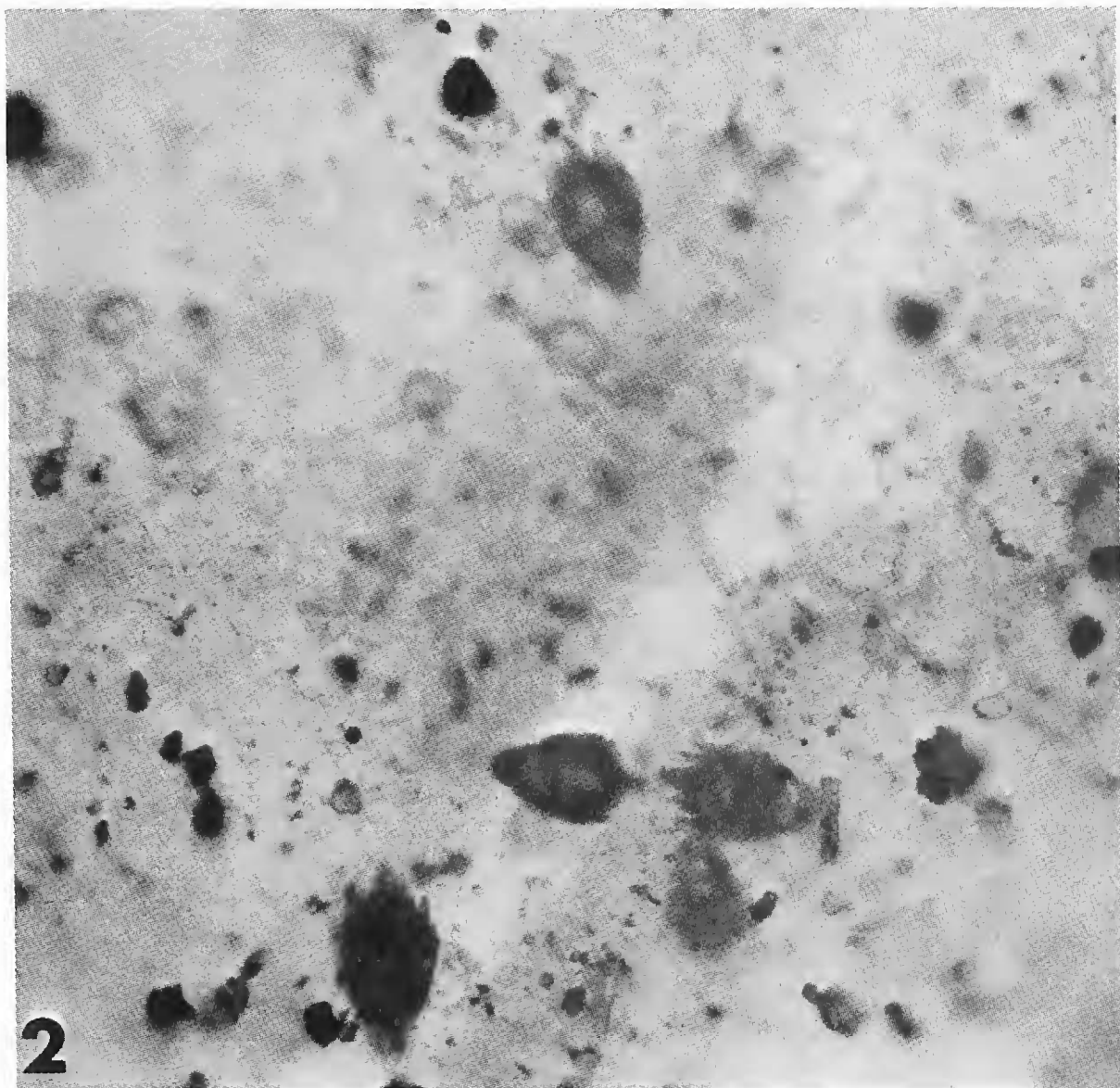


Fig. 2 — Heteromorphic females as they appear under coating. Ca. 228 X.

Cisaberoptus kenyae is not only notable for the coatings it makes, but it is also of interest because of different structural forms in colonies under the coatings. There are three adult forms or types as follows:

One form is the male (Plate 1) which is a rather ordinary, somewhat flattened eriophyid, with generalized structures, and which fits easily into the genus *Eriophyes*. It has an ordinary-type gnathosome. The propodosomal shield has dorsal setiferous tubercles on the rear margin directing the setae to the rear. This male shield is almost entirely devoid of any markings or pattern, but it does show a curved line just on the inner side of the dorsal tubercle that is similar to the curved line present in the same position on the shields of females in the colonies. The abdomen is completely microtuberculate and it tapers regularly to the terminal lobes. Males vary somewhat in size and the feather-claws (empodia) have 5 to 8 or 10 rays. The genital

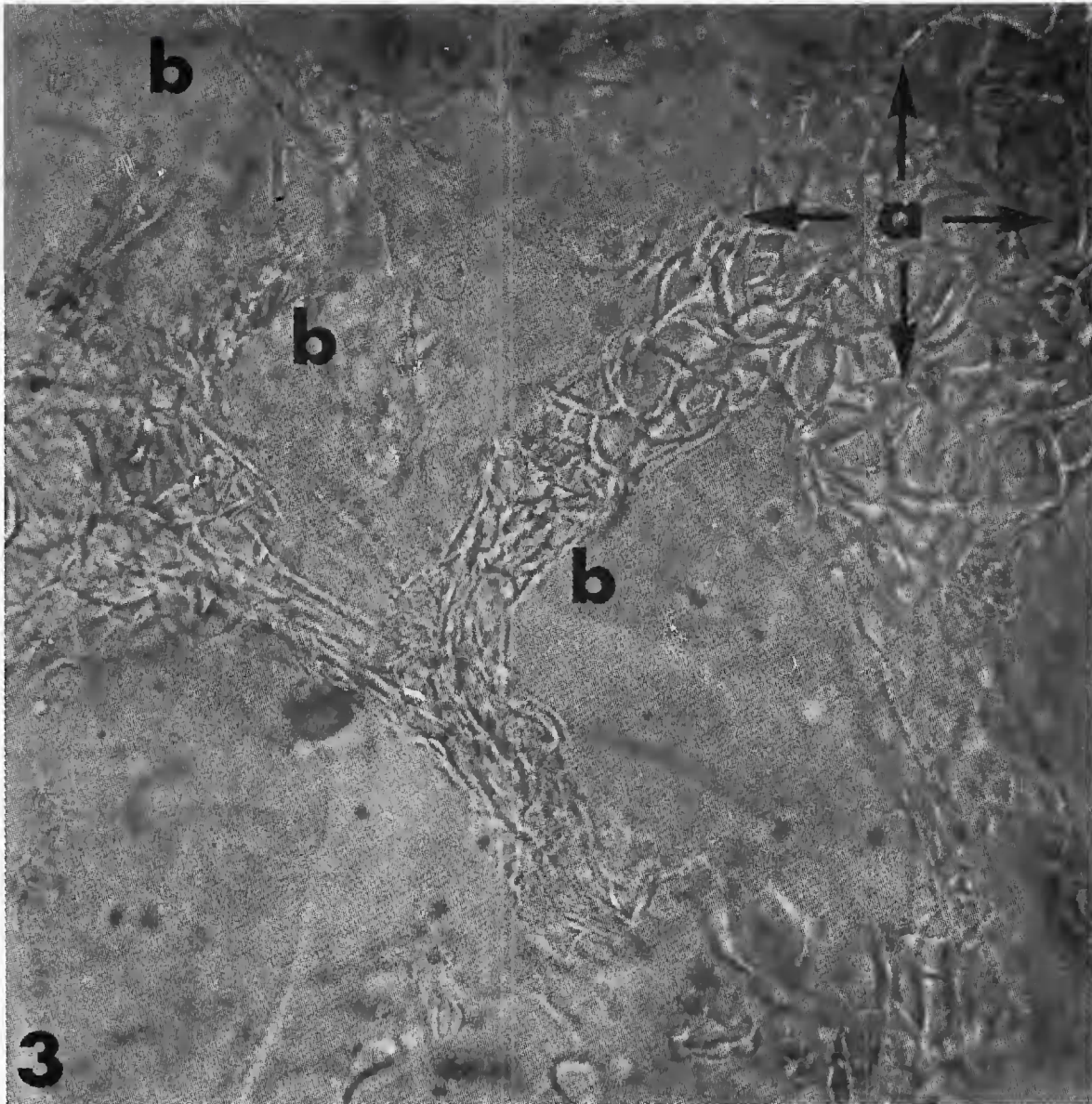


Fig. 3 — a. Bunched strands in coating
 b. Separate strands forming compartments. Ca. 1140 X.

setae are quite small. Average male length from the anterior shield edge to the termen is 140μ .

The second form in these colonies is the female which more or less resembles the male, except for genitalia, and is therefore the protogyne or primary female. These protogynes vary somewhat in size and in featherclaw rays, and it is possible to divide them into subgroups. Featherclaw rays on these protogynes run from 7 to 12. Protogyne gnathosomes are normal in shape. Protogyne lengths range from 145μ to 165μ .

The third adult form under the coatings is the most numerous, the most standardized, and usually the only type easily recovered for examination (Fig. 2). It is the female that differs notably from the more generalized types described above (Plate II). This third form is the deutogyne. It is flattened, but its most outstanding features are the

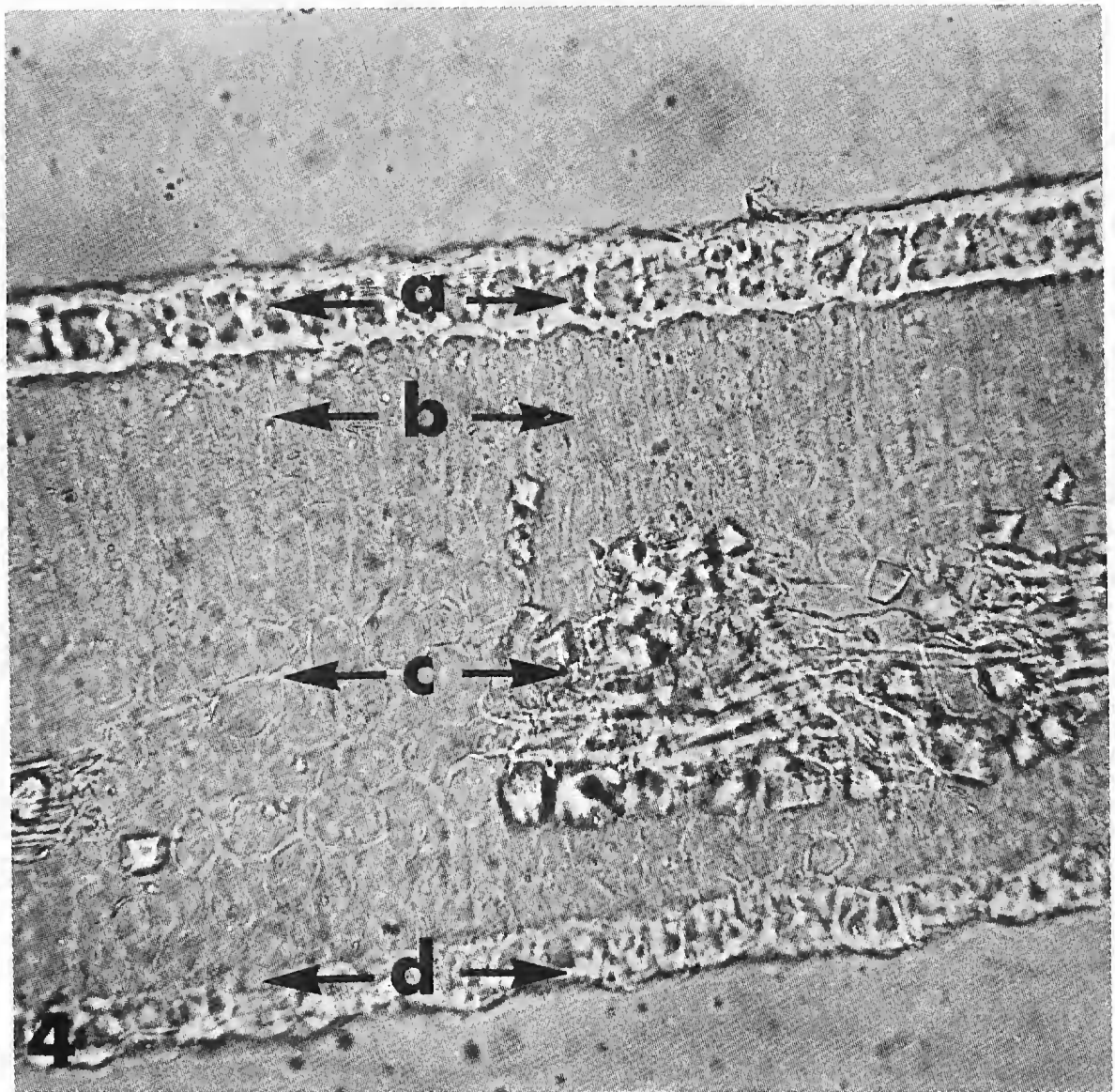


Fig. 4 — Cross section of infested leaf showing interior tissue is not entered by the mites. a. upper epidermis; b. palisade cells; c. parenchyma cells; d. lower epidermis.

stocky legs, large complicated featherclaws, and most notably the stiffened gnathosome. This gnathosome projects ahead and terminates in a pair of expanded spatulate structures. (Fig. 2 and Plate II). These spatulate or 'shovel-nosed' females are therefore the secondary females and differ mainly by the modified gnathosomal structures and enlarged legs. These deutogynes are similar to the primary females, or protogynes, as regards genital structures and the curved lines on the inner side of the propodosomal shield tubercles. The large complicated featherclaws have what appears to be 16 to 18 rays. Deutogynes average 170μ in length.

No nymphs of *kenyae* on slides have shown spatulate gnathosomes, but a few second stage nymphs have disclosed developing adults inside that have spatulate gnathosomes.

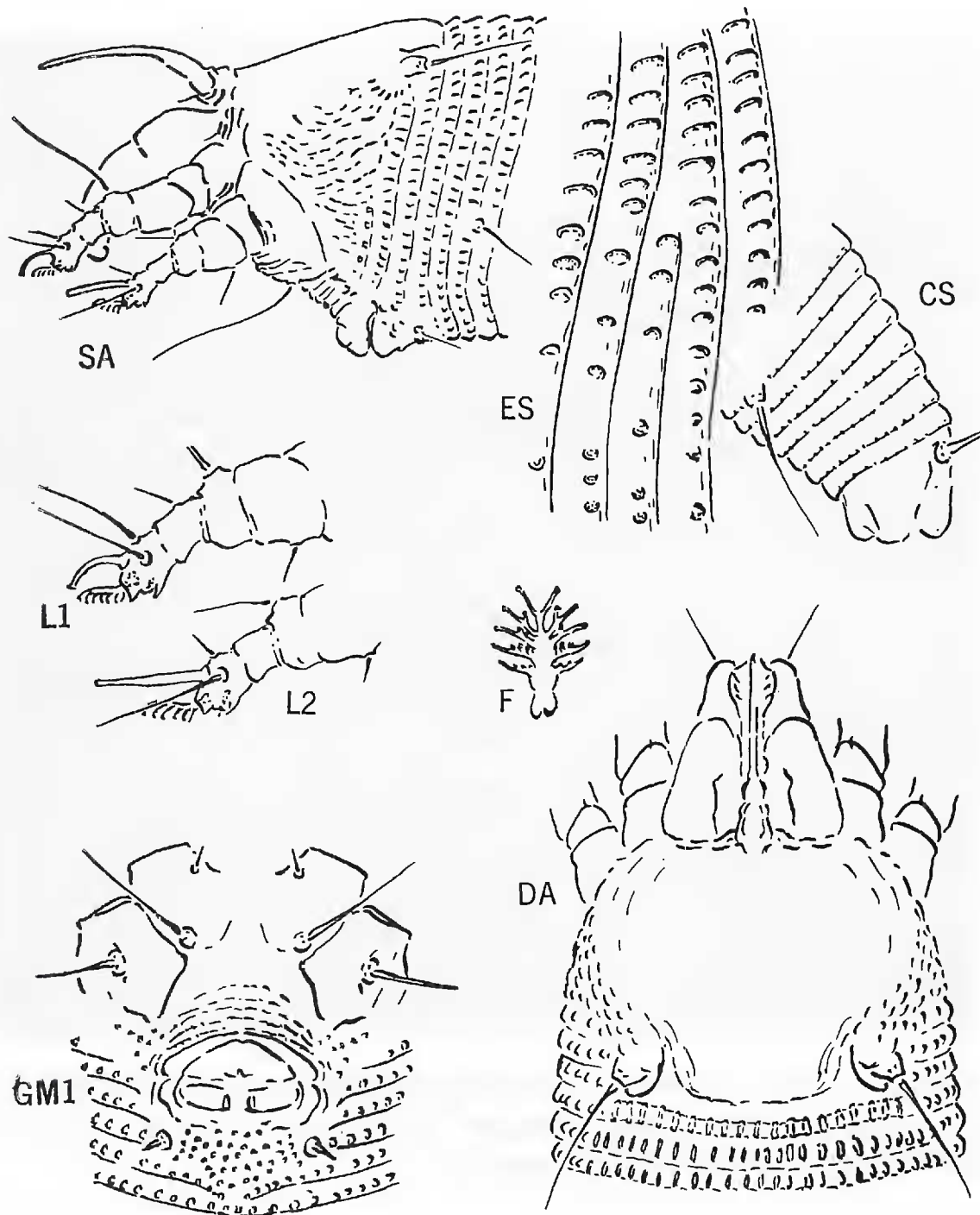


Plate I — *Cisaberoptus kenyae* male.

Abbreviations on Plate I and II

API — internal female genital structures; CS — caudal section of mite; DA — dorsal view of anterior section of mite; ES — detail of side ring structures and microtubercles; F — featherclaw or empodium; GF1 — female genitalia and coxae; GM1 — male genitalia and coxae; L1 — left foreleg; L2 — left second leg; S — lateral diagram of mite; SA — lateral view of anterior section of mite

The first stage nymphs of *kenyae* have about the same basic arrangement of the dorsal shield tubercles and setae, and the same interruption of anterior abdominal dorsal rings as other first nymphs

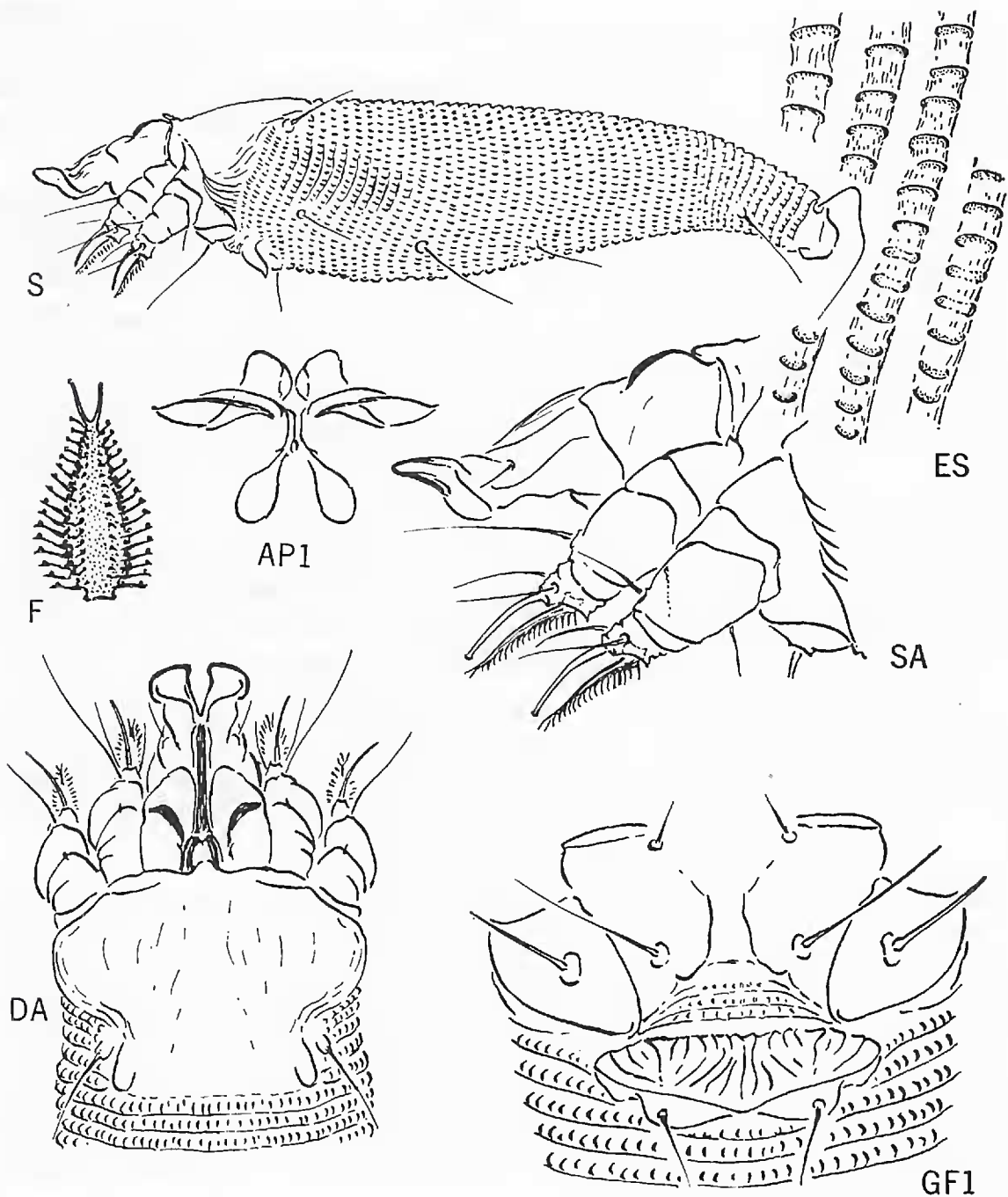


Plate II — *Cisaberoptus kenyae* deutogyne.

in various genera of the Eriophyidae have (Jeppson, et. al. 1975:432, 442). The dorsal tubercles are set ahead of the rear shield edge and the setae point up and ahead. Several rings behind the shield are discontinuous dorsally. The first three subventral abdominal setae on these first stage nymphs are reduced to small or minute size. The last subventral abdominal setae before the terminal lobes are of usual size. *These first stage nymphs lack the genital setae* which is a feature not previously observed on other first stage nymphs. There are no abdominal microtubercles present on the first stage nymph.

Second stage nymphs have setae about as on adults, perhaps shorter, but the second stage nymphs share with first stage nymphs the lack of genital setae. Abdominal microtubercles on the second nymphal abdomen are present behind the shield, behind the coxae, and just before the terminal lobes.

This mango leaf coating eriophyid was the first tropical member of this family that has proved to be deuterogynous. (For a second tropical deuterogynous species see Keifer 1977:1,2). Deuterogyny is common among temperate and cold region eriophyid species, mainly among those that live on deciduous hosts. The female present in temperate regions that displays structures not on the male is the deutogyne or secondary female. These temperate region deutogynes serve to carry the species over unfavorable periods, chiefly through winter. In the spring these overwintering deutogynes start new colonies and then disappear from the colonies. New deutogynes develop later in the summer in response to changing host and weather conditions. While these new deutogynes carry sperm over winter they are not known to be able to lay eggs until they are subjected to winter chill.

On the other hand *kenyae* deutogynes, with spatulate gnathosomes, are always present in colonies on mango leaves, and they are active egg layers, as shown by slide mounted females of this type that contain eggs. Thus the *kenyae* deutogyne performs a function different from the temperate region deutogyne.

Leaf coating deutogynes in colonies, as well as being active egg layers, are evidently the form principally instrumental in tending the coatings. These females congregate around the edges of the covered areas where they presumably expand the coating, and by means of their stiff, spatulate gnathosomes keep the coating raised enough to provide mite space for the colony members. Inactive living *kenyae* deutogynes can aestivate for a period of a month or more. These deutogynes also travel as shown by their presence on grease coated plates hung in infested groves.

There is at present only one other eriophyid known to be a close relative of *kenyae*. This is *Aberoptus samoae* Keifer (1951). It occurs on mango in the Samoan Islands. It differs from *kenyae* principally by having the spatulate organ on each of the foretibiae, and the forelegs are stiffened. While this suggests that the female of *samoae* as described is the deutogyne, and has functions similar to *kenyae*, the bionomy of *samoae* is as yet unknown.

Together, *Aberoptus samoae* and *Cisaberoptus kenyae* constitute the eriophyid subfamily Aberoptinae.

The mango genus, *Mangifera*, has several species in it. The host of *kenyae* is *Mangifera indica* L., the well known mango. The precise identification of the Samoan host of *samoae* is unknown, and the differences between the position of the spatulate organ on the two species of eriophyids suggests that possibly the Samoan tree is not *indica*. Further exploration may well disclose additional members of

the Aberoptinae.

As far as presently known all deutogynes in the large subfamily Eriophyinae of the Eriophyidae are more generalized in their structures than the males and protogynes, and therefore do not furnish characters useful in defining taxa. So the practice has been to ignore them for such definitions.

But this rule now proves inapplicable to members of the subfamily Aberoptinae of the Eriophyidae. The stiff spatulate gnathosome of the *kenyae* deutogyne, and the stiff spatulate forelegs of *samoae*, compel their use in defining the genera and subfamily to which they belong.

But the Aberoptinae are not the only group in the Eriophyoidea that have deutogynes with useful defining features. In the Diptilomiopidae there are two species possessing flat-backed deutogynes that constitute the genus *Abacoptes* (Keifer, 1939b, 1944). The two diptilomiopids are now quoted as *Rhyncaphtoptus ulmivagrans* Keifer (1939a), and *Rhyncaphytoptus fagifoliae* Keifer (1940). These two species should now be referred to as *Abacoptes ulmivagrans* (Keifer), and *Abacoptes fagifoliae* (Keifer). For an account of the rearing that proved that the genotype of *Abacoptes*, which is *platynus* Keifer, is the deutogyne of *ulmivagrans* see Keifer (1944).

Acknowledgement

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